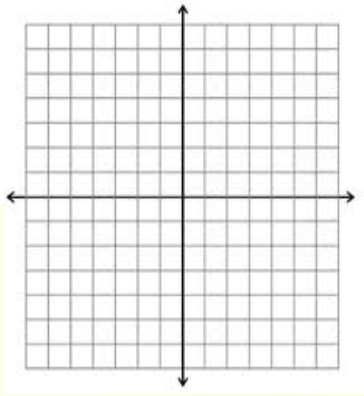
Alg. 2 Warm Up # 7-4

Graph the following systems of inequalities.

1. $y \geq 3(x-2)^2 - 4$
   $y > -2|x-1| + 3$

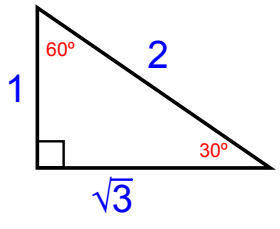


2. Expand: $\log_3\left(\frac{x^8}{5y}\right)$

3. Condense: $\log_7(x+2) + \log_7(x-2)$

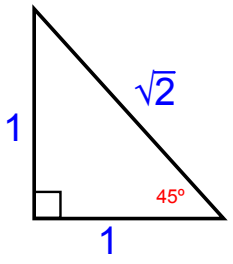
Math Spiral:

30º - 60º - 90º hyp = 2 (sh. leg)



long leg = $\sqrt{3}$ (sh. leg)

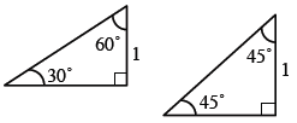
45º - 45º - 90º hyp = $\sqrt{2}$(leg)



HW Questions:

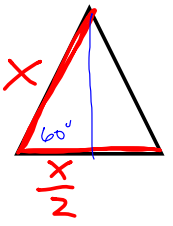
Review & Preview

7-15. Copy the triangles at right.

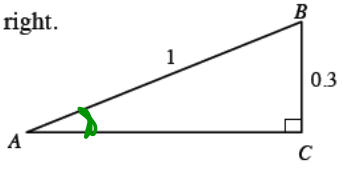


a. Label the missing sides with their *exact* lengths. That is, leave your answers in radical form.

b. The $30° - 60° - 90°$ triangle is sometimes called a half-equilateral. Draw a picture to illustrate this, and explain how that fact can be used to help label the missing sides in part (a).



7-16. Find the measure of angle A in the diagram at right.



$\sin A = \frac{0.3}{1}$

$A = \sin^{-1}(0.3)$

$\approx$

7-17. Find the x- and y-intercepts of the quadratic function $y = 2x^2 + x - 10$.

-18. Evaluate each expression without using a calculator or changing the form of the expression.

a. $\log(1)$

b. $\log(10^3)$

c. $10^{\log(4)}$

d. $10^{3\log(4)}$

$\log_{10} 10^3 = 3$

$10^{?} = 10^3$

-18. Evaluate each expression without using a calculator or ~~changing the form of the expression~~.

(a.) $\log(1)$ Base 10 raised to what power gives you 1?

b. $\log(10^3)$

c. $10^{\log(4)}$

d. $10^{3\log(4)}$

A good tool if you are confused...
Set the expression = to y, then change forms to see if you can tell what y is.

c) $10^{\log 4} = y$

$\log_{10} y = \log_{10} 4$

$y = 4$

So $10^{\log 4} = 4$

d) $10^{3\log(4)} = y$

$\log_{10} y = 3\log_{10} 4$ (put back up as an exponent)

$\log_{10} y = \log_{10} 4^3$

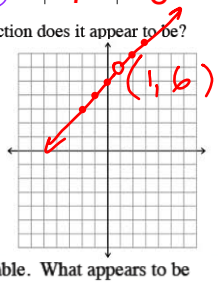
$y = 4^3$

So $10^{3\log 4} = 4^3$

7-19. Complete the table of values for $f(x)=\frac{x^2+4x-5}{x-1}$.

x	−2	−1	0	1	2	3
y	3	4	5	☹	7	8

a. Graph the points in the table. What kind of function does it appear to be? Why is it not correct to connect all of the dots?



f(0.9) = 5.9

f(1.1) = 6.1

b. Look for a simple pattern for the values in the table. What appears to be the relationship between x and y? Calculate $f(0.9)$ and $f(1.1)$ and add the points to your graph. Is there an asymptote at $x=1$? If you are unsure, calculate $f(0.99)$ and $f(1.01)$ as well.

c. Simplify the formula for $f(x)$. What do you think the complete graph looks like?

$y=\frac{(x+5)(x-1)}{(x-1)}$

$y=x+5$

$y=1+5$

$y=6$

7-20. In 1998, Terre Haute, Indiana had a population of 72,000 people. In 2000, the population had dropped to 70,379. City officials expect the population to level off eventually at 60,000.

a. What kind of function would best model the population over time? exponential

b. Write an equation that would model the changing population over time.

horizontal asymptote at 60,000

$y=ab^x+60{,}000$

Let $x=0$ in 1998

$(0, 72{,}000)$

$72{,}000=ab^0+60{,}000$

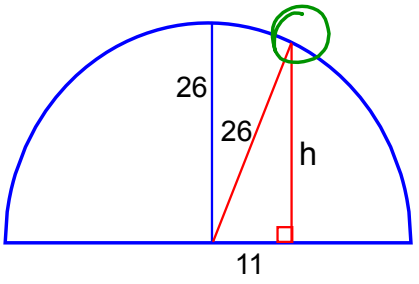
$-60{,}000 \quad -60{,}000$

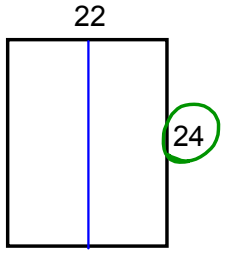
$12{,}000=a$

$\rightarrow y=12{,}000b^x+60{,}000$

plug in $(2, 70{,}379)$ to find b.

7-21. A semi-circular tunnel is 26 feet high at its highest point. A road 48 feet wide is centered under the tunnel. Bruce needs to move a house on a trailer through the tunnel. The load is 22 feet wide and 24 feet high. Will he make it? Use a diagram to help justify your reasoning completely.





house & trailer

$11^2 + h^2 = 26^2$

$121 + h^2 = 676$

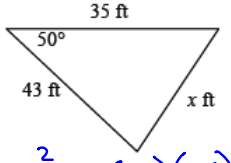
$h^2 = 555$

$h \approx 23.56$

height of the tunnel at the edge of the house is not tall enough!

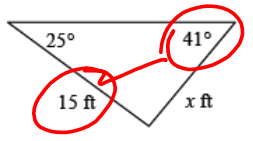
7-22. Find the value of x.

a. Use Law of Cosines



$x^2 = 43^2 + 35^2 - 2(43)(35)\cos 50°$

b. Use law of Sines



7-23. Solve the system of equations shown at right.

$x + y + z = 40$

$y = x - 5$

$x = 2z$

$y = 2z - 5$

$2z + 2z - 5 + z = 40$

CP's: 7- # 12, 13

7.1.2 How can I graph it?

Graphing the Sine Function

Today you will use what you know about right-triangle relationships and graphing functions to investigate a new function.

7-12. *"HURRY!!! Let's get there before the line gets too long!"* shouts Antonio to his best friend René as they race to get on *The Screamer*, the newest attraction at the local amusement park.

"It's only been open for one day, and already everyone is saying it's the scariest ride at the park!" exclaims Antonio. *"I hear they really had to rush to get it done in time for summer."*

Antonio whistles as he screeches to a halt in front of the huge sign that says, *"Welcome to The Screamer, the Scariest Ride on Earth."* The picture below it shows an enormous wheel that represents *The Screamer*, with its radius of 100 feet. Half of the wheel is below ground level, in a very dark, murky pit with water at the bottom. As *The Screamer* rotates at dizzying speeds, riders fly up into the air before plunging downward through blasts of freezing air, hair-raising screams, and sticky spider webs into the pit where they splash through the dark, eerie water on their way back above ground.

René and Antonio wait impatiently to get on the ride, watching passengers load and unload. New passengers get on and strap themselves in as others emerge from the pit looking queasy. The ride rotates 15° to load and unload the next set of riders. As René straps himself in, he remembers Antonio's ominous words: *"I hear they really had to rush to get it done in time for summer."*

Sure enough, just as the ride plunges René and Antonio into the greasy water, they hear the piercing scream of metal twisting. Sparks fly and the pit fills with smoke as the ride grinds to a halt. To escape, all of the passengers must climb vertically to ground level from wherever they got stuck, either up from the pit or down from dizzying heights.

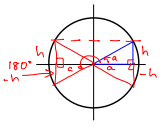
Your Task: Find a function that describes the distance each passenger must climb in order to escape from the broken ride, *The Screamer*.

x	y_1	y_2
0	0	0
15	2.6	0.26
30	5	0.5
45	7.1	0.71
60		
75		
90	10	

a. Follow the directions on the CP worksheet, instead of the book.

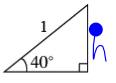
b. Graph your data on a large graph.

c. Suppose you were asked to add 20 more data points to your table. What shortcuts could you use to reduce the amount of work?



x	y_1	y_2
a	h	h ÷ 10
180 − a	h	
180 + a	−h	
360 − a	−h	

7-13. The function that models the situation in problem 7-12 is a new parent function. To help you figure out what it is, sketch the right triangle shown in the diagram at right.



a. With your team, write an equation and use it to calculate the height of the triangle. Does the calculated escape height seem reasonable when compared to the data you collected in problem 7-12?

$\sin 40° = \frac{h}{1}$

$h \approx 0.64$

b. Write an equation representing the escape height $h(\theta)$ for *any* passenger, that is, for any angle of rotation of *The Screamer*. Note that the symbol θ is the angle represented by the Greek letter "theta."

$h(\theta) = \sin\theta$

c. Enter the data from the first two columns of your table into your graphing calculator. Adjust the viewing window so you can see all of the data. Then graph $h(\theta)$ on top of the data. How well does $h(\theta)$ fit your data?

x & y_2

STAT PLOT

Y=

d. Adjust the viewing window so that you can see more of the graph of $h(\theta)$. Describe the behavior of the graph as θ gets larger. Does this make sense? Why or why not?

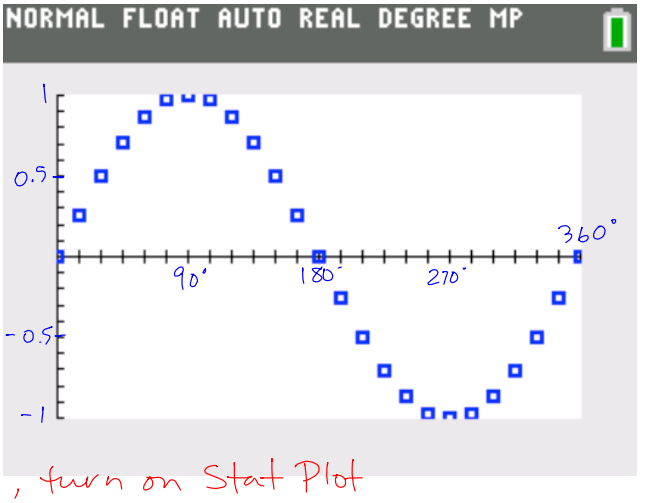
e. Use the 'table' function of your calculator to find the values that it calculated for $h(\theta)$. Add another column to your table from problem 7-12, label it with the equation you found for $h(\theta)$, and enter these values, rounding off to the nearest hundredth. How do the calculated values compare with your measured ones?

TABLE SET

TBL Start:

13c) WINDOW

x-min: 0
x-max: 360
x-scl: 15
y-min: −1
y-max: 1
y-scl: 0.1



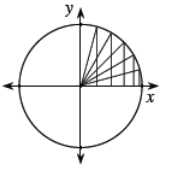
In degree mode, turn on Stat Plot

Enter x (angles) in List 1 → STAT Edit

Enter y_2 (heights) in List 2

CP's: 7- #14

7-14. René and Antonio finally make it home from the amusement park unhurt, but in need of a shower. As soon as they have cleaned up, they go over to a friend's house to share their scary experience on *The Screamer*. They draw a picture of the Ferris wheel and five of the seats, located at 15°, 30°, 45°, 60°, and 75° (shown at right and on the Lesson 7.1.2D Resource Page provided by your teacher).

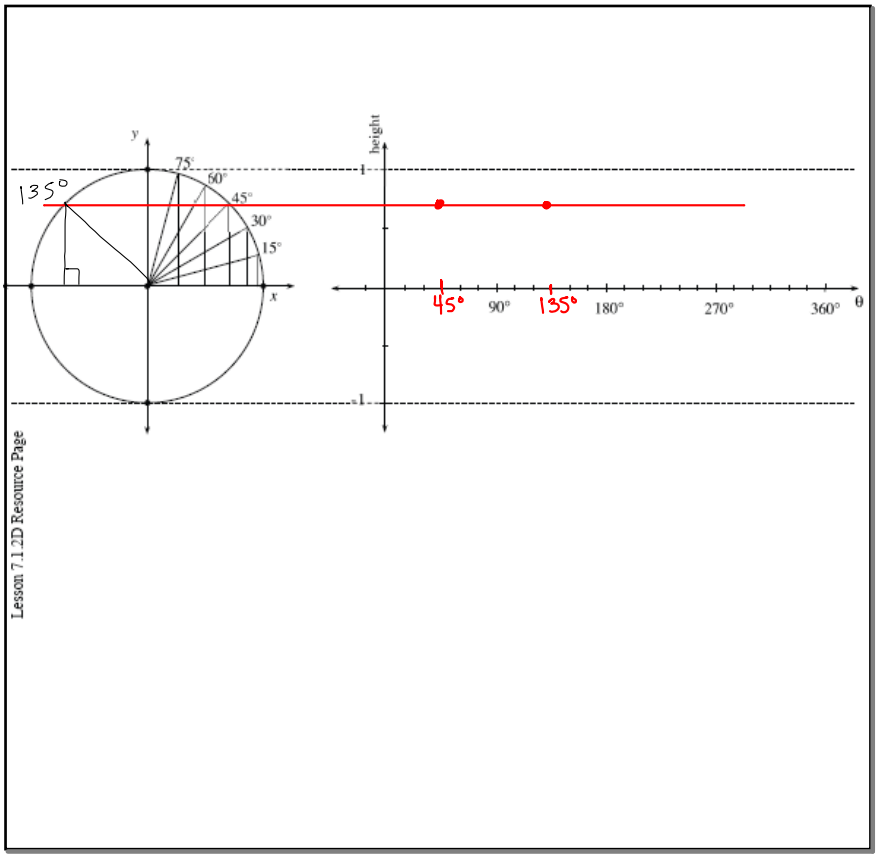


a. Label each triangle with its *calculated* height. You can use your data from problem 7-12. If you do not have data for all of these angles, return to the 'table' function on your calculator. Plot these heights at their angle location on the coordinate system to the right of the circle. You will be plotting points in the form (x = angle in degrees, y = height).

b. Draw five new triangles that are congruent to the first five, but that are located in the second quadrant. Label these with their angle measures (from 0°) and heights. Use the angle measures and heights to plot five new points on the graph that correspond to these five new points on the circle.

c. Continue this process by drawing triangles in the third and fourth quadrants. You should have a total of twenty triangles drawn and twenty points plotted. Then label the points where the circle intersects the x- and y-axes with their angle measures and heights and then add points for them to the graph as well. Sketch a smooth curve through the points.

d. With your team, discuss all of the relationships you can find among the points on the circle and between your unit circle and the graph. Be prepared to share your ideas with the class.



Week 7

Warm up

Purple Rational Expressions

CP's: 7- #12, 13 (Yellow & Screamer)

CP's: 7- #14 (Green)

HW: 7-

#24 ---> 32